Ontario fish and wildlife Review

Vol. 14, No. 3, 1975

Our cover catches a milkweed at its moment of glory, bursting its pod in the sights of Erika Thimm of Wildlife Branch who was stalking fall flowers at the time. At the top, back cover, is her aster, followed clockwise by her New England aster, black-eyed susan, goldenrod and chicory.

In this issue, Carsten Jorgensen introduces *Fishing for Flavour,* our new feature for sporting gourmets.

Bob Alison presents the credentials for the ring-necked duck, a former tourist to Ontario that now may be regarded as a landed immigrant, migratory-type.

Al McCombie and Al Berst pause in their research investigations to pass along the basic facts on rainbow trout ponds and rainbow trout *in* ponds.

Mike Hart of North Bay explains how the threat of atomic warfare has been a great help in his walleye management program.

Bob Gater describes the trap net and its importance in fisheries studies.

Last and liveliest, Dan Strickland answers the north-goers who complain "What good are black flies?"

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The goal of the Ministry of Natural Resources is to provide opportunities for outdoor recreation and resource development for the continuous social and economic benefit of the people of Ontario, and to administer, protect and conserve public lands and waters.

Ontario
Ministry of Natural Resources

Hon. Leo Bernier
Minister

Dr. J. K. Reynolds
Deputy Minister

EDITORIAL

WHO PROTECTS? WHO DESTROYS?

Hunting has so many adherents and well-wishers in Ontario we can sympathize with outdoorsmen who hunt when they are confronted by the condemnation of fellow taxpayers who want to take away their recreation.

The confrontation leads to counter arguments and these are followed by rebuttals, and away we go again on the wings of controversy. Too bad it's never productive. A general verdict is never reached because the conflicting views are based on different standards in aesthetics, ethics and economics.

Instead of indulging our private views and judging whether hunting is a good or bad activity, let us look more deeply into the long-term effect of all outdoor activities and ask the fundamental question: Who protects the natural environment? . . . Outdoorsmen with a sense of responsibility and a desire to know more about nature. The list is long and includes hunters, anglers, naturalists, canoeists, back-packers, day-hikers and campers of all ages.

This brings us to the obvious question: Who destroys the natural environment? . . . Non-hunters, non-anglers and non-naturalists — people who simply do not care about the environment or the experiences cherished by true outdoorsmen. Bringing the city with them, they invade parks and Crown lands to harass wildlife, pick and trample wildflowers, chop down trees, and break down seedling trees and other vegetation with motor vehicles.

On summer rampages, they like to set up loudspeakers, build roaring campfires and carouse close to nature — without ever knowing what it is to be a part of nature. Then they return to the city, leaving behind a blanket of bottles, broken glass, tin cans, waste paper and other refuse — and a ruined weekend for any outdoorsmen in the area.

These outdoor vandals devastate the environment and destroy the experiences of those who honestly seek to live close to nature for at least a little while. These despoilers of the environment are consumers of the worst kind. They destroy natural things, and they put nothing back.

How very different are the outdoorsmen who sometimes hunt. The ethical hunter is keen to protect and maintain the natural environment. For example, if it were not for the care and attention of many duck hunting organizations, many of our best wetland wildlife habitats would have been lost long ago.

Turning now to the outdoorsmen who do not hunt and who, in fact, may not approve of hunting as a recreation, it is obvious that they are natural allies of hunters in their fundamental approach to the natural environment. Their enemies are not hunters. Their enemies are the outdoor vandals.

We hope all outdoorsmen will try to resolve their differences and join forces as allies to protect the natural environment against those who do not know and do not care about the wonders of nature and the great out-of-doors.

VOL. 14, NO. 3 ONTARIO FISH AND WILDLIFE REVIEW FALL, 1975

FISHING FOR FLAVOUR

BROWN BULLHEAD

by C. R. Jorgensen
Biologist, Lake Nipissing
Fisheries Assessment Unit

To many anglers, the brown bullhead, *Ictalurus nebulosus,* is known as mud cat, horned pout or barbotte and most often as catfish. It is usually from eight to 14 inches (203 to 356 mm) in length and weighs less than a pound or half a kilogram.

It is a chunky fish with a slippery, scaleless skin ranging in color from olive to dark brown. Its mouth is large and wide and has eight barbels which anglers call "whiskers". It is its whiskered appearance that is responsible for its common name, catfish.

Some anglers are quick to warn newcomers to the fraternity that the whiskers will cut unwary fingers. This is not true, but the spines in the dorsal and pectoral fins are pointed and will cut the flesh unless handled with care.

The brown bullhead is not protected by season or creel limits and can provide anglers with excellent recreation and food before the opening of the seasons for the protected sport fish.

Brown bullheads usually inhabit shallow water where aquatic vegetation is abundant, and they feed mainly at night. They are bottom feeders and should be fished with the baited hook resting on the bottom.

Most anglers favour worms as bait but the the brown bullhead will eat almost everything. Its food includes molluscs, insects leeches, crayfish, plankton, worms, algae, plant material, fish and fish eggs.

Some anglers bait their hooks with corn, hellgrammites, crayfish, blood baits, dough balls and even chunks of laundry soap. Baits that emit an odor are especially effective because the brown bullhead locates food with the barbels which contain its organs of taste and smell.

Many boat fishermen use a cane pole from eight to ten feet (three metres) in length with an equal length of line, but some use only a hook and line when fishing in shallow water. It is important to be equipped with lots of extra hooks because bullheads often swallow the bait, and it is easier to cut the line than to remove the hook.

The following bait recipe is recommended highly. Mix one cup of flour, one cup of corn meal and ten tablespoons of thick molasses. Stir into a stiff dough and roll into bait balls. Drop into boiling water and boil ten minutes. Remove and drop into cold water. This bait stays on the hook.

The brown bullhead makes excellent eating. According to an account in Field and Stream Magazine, in the heyday of the Pullman car era, bullhead was often served as trout to unknowing but well-heeled diners.

Novices are often baffled by the bullhead's tough hide but this should not deter them from a good meal. Rather than nailing the fish to a fence and pulling the skin off with pliers, the following method is suggested.

With a sharp knife, make a cut across the back, right behind the dorsal fin, down to the bone. Then, with the tip of the blade, split the skin from the original cut (at the dorsal spine) toward the tail and as far as the adipose fin. Now grasp the fish in both hands, one hand holding the head (being very careful of spines) and the other hand holding the body of the fish. Now bend it double so that the back arches upward. The backbone will break and the broken end will pop up. Now, either with the fingers or a pair of pliers, pull up and back. The body of the fish will peel back from the skin and head, leaving the viscera with the skin. The fish is now ready to cook. With practice, this is easily and quickly accomplished.

In the southern and mid-western United States, franchised catfish restaurants have become popular, and "catfish" have great appeal in many parts of Canada as well.

The flesh is firm, reddish to pink in color, and delicious when cooked in a variety of ways or hot-smoked.

CATFISH COOKERY

Gourmet Fried Catfish

2 lbs. catfish fillets (1 kgm)
1 tsp. salt
½ tsp. garlic salt
⅓ cup instant mashed potato powder
¼ cup fat for frying
½ cup chicken broth
1 tbsp. parsley
1 tbsp. chopped green onion

Cut fillets in serving-size portions. Add salt and garlic salt to potato powder. Dip fish in potato mixture and brown on both sides in fat. Reduce heat and add remaining ingredients. Simmer in covered pan five to 10 minutes until fish is almost cooked. Re-

PLEASE TURN TO PAGE 18

Photo of ring-necked duck by Dr. W. A. Crich, Royal Ontario Museum.

THE RING-NECKED DUCK — A NEW SPECIES IN ONTARIO?

by R. M. Alison
Waterfowl Biologist, Wildlife Branch

THE ring-necked duck, *Aytha collaris,* is a diving species named for a plumage characteristic visible only in adult males. It has many local names including ring-billed duck, black head, black duck, raft duck and fall duck. The Cree of northern Ontario group the ring-necked duck with the lesser scaup and call them *Tuck wa' Kesip* or fall ducks. In western Canada, the Cree refer to both species as *Nanatahawaoosip.*

Ring-necked ducks are closely allied with the tufted duck of Eurasia. Superficially, they resemble scaup with which they often associate, particularly during migration.

Both sexes have a grey speculum and a distinct blue-white ring around the bill. The adult male has an indistinct chestnut collar. The species is usually seen flying in small flocks of from six to 12 birds. They fly in open formation and their flight is swift and direct. From the ground, they appear small with black upper parts and white breast.

Ring-necked ducks typically nest in wet, boggy areas bordering sloughs and ponds. There is no competition with other resident species for this kind of nesting habitat. In early September, they congregate in the marshes along the shores of the Great Lakes, and migrate in October and November.

The ring-necked duck did not appear among the specimens collected by the Hudson's Bay Company in Ontario and forwarded to Britain in the 17th century. However, the "Sportsman and Naturalist in Canada, 1866" notes that the species occurred commonly in Ontario in spring and fall, but did not breed in the province. There are unconfirmed records indicating that the ring-necked duck bred in Ontario in 1908 (Nash, Checklist of Birds of Ontario). Historical specimen evidence of the ring-necked duck in Ontario was scant until 1919 when downy young were collected at Lac Seul. In 1925, A. C. Bent believed that there was no evidence that these birds bred east of Thunder Bay.

It is apparent that the species has become much more abundant in the province since that time and breeds commonly in all but extreme southwestern Ontario. They have been widely distributed throughout the province since about 1950 but are not common at any one location.

There is no evidence that these birds bred in central or eastern Ontario prior to the 1920s, but there are historical data indicating earlier occupation in northwestern Ontrio. Ring-necked duck bones were found at Fort Michilimackinac — two dated at 1715 to 1760, one at 1760 to 1780, and one at 1805 to 1814. Skeletal evidence was found at Whitefish Lake at an Indian site occupied prior to 1890. There is no skeletal evidence of this species from Indian sites east of Sault Ste. Marie. Since 1950, the species has also become abundant in Quebec and now breeds in New Brunswick, P.E.I., Nova Scotia and western Newfoundland in moderate numbers.

Continental banding data suggest that these birds increased in numbers in the 1960s, primarily on the prairies, but decreased significantly during the period 1970-74. The annual U.S. and Canadian harvest is about 450,000 birds.

In Ontario, the species has been banded in small numbers since 1920 although there have been only 82 recoveries. About 33 per cent of these occurred within the province although the proportion recovered elsewhere is apparently increasing.

Ring-necked ducks banded in western Ontario are recovered primarily in Wisconsin (10 per cent) and Minnesota (5 per cent) whereas birds banded in eastern Ontario are recovered mainly in Florida (18 per cent) and in North and South Carolina (7 and 6 per cent respectively). The birds are difficult to capture, except through drive-trapping in August and as a result there have not been a sufficient number banded in Ontario to indicate provincial population trends. It is therefore necessary to rely on harvest statistics to determine their status.

In the eastern United States, the 1967 harvest was reportedly 113,100, compared to 34,000 in 1973. Similar but less drastic fluctuations occurred in the central U.S. It is doubtful that such data are totally reliable although there are indications that significantly fewer of these birds are now taken in the U.S. as compared to the 1960s. At recent Atlantic Waterfowl Flyway meetings, waterfowl biologists from South Carolina

Ring-necked ducks. Photo by the author.

and Georgia have expressed great concern at significant decreases in the population of this species in the southern U.S., mainly in areas where Ontario breeding stock winters.

In Newfoundland, Nova Scotia and Quebec, where the species is becoming established, the harvest has increased since 1967 whereas in New Brunswick, it is stable. It is likely that the maritime and Quebec harvest rates reflect population trends in those areas.

It appears that the Ontario population of this species is stable despite a significant harvest of local breeding populations early in the hunting season and an almost complete occupation of the suitable boggy sloughs in Ontario north of 44° latitude — and thus a relatively inelastic supply. In other words, we harvest only birds that are reared in Ontario.

Should the Ontario population of the ring-necked duck decrease, it might be difficult to implement suitable management practices. It is possible that a reduction in ring-necked duck kill in Ontario, about 70,000 annually, particularly south of Highway 17, might be desirable to prevent a long-range decrease in harvest. It might be possible to reduce harvest through restrictive bag limits. Unfortunately, most hunters are unable to distinguish these birds from scaup or redheads and it is doubtful that bag limit restrictions would be of great value.

However, only 58 per cent of Ontario hunters harvest more than one ring-necked duck daily, only 35 per cent take more than two, only 20 per cent take more than three, and only 12 per cent take more than four. Thus, to reduce the harvest by 35 per cent, a daily bag limit of two would be required, whereas a 20 per cent reduction would require a limit of three.

Perhaps the most useful task would comprise identification and description of major ring-necked duck breeding and staging areas. Subsequently, delayed openings and/or restrictive bag limits, in association with widespread local publicity, might be attempted. Such attempts are currently being made by waterfowl biologists in the eastern United States (staging areas).

No one knows for sure why the ring-necked duck has successfully moved east into Ontario and beyond in recent years. We must ensure the continued presence of this interesting addition to the fauna of Ontario through proper management in the years to come.

INTROSPECT

A personal opinion
not necessarily endorsed by
the Ministry of Natural Resources

IN DEFENCE OF BLACK FLIES

by *Dan Strickland**

In June the air is filled with two things. First, there are millions of black flies, and then, flying in hot pursuit, are almost as many unprintable words. But however heated tempers may be, we think the time has come to say a word in defence of our tiny, speechless brethren.

To begin with, Algonquin black flies should not all be tarred with the same brush because there is not just one kind but well over two dozen. Of these, only five bite human beings. The others include species which bite only birds, for example, and still others that never bite animals at all.

Our black fly species have other distinguishing differences in structure, markings and life history, but they all share in common certain basic strategies for success. We believe these strategies are so ingenious that even the most rabid black fly hater must grudgingly admit that the little b . . . have some clever tricks up their non-existent sleeves.

Black fly eggs are laid at the surface of running water, where they drift down and become lodged in the stream bed, or are attached to rocks or vegetation. With some species, the eggs pass the winter in a resting state and do not hatch until the following spring.

Others hatch shortly after being laid, and the tiny, worm-like larvae are active, although slow-growing, throughout the winter. It is a simple matter, by the way, to see black fly larvae, even on the coldest Algonquin winter day, merely by looking closely at rocks and pebbles in unfrozen streams.

The key thing is that the larvae live in running water. At first glance, this might seem to be a rather unpromising place to

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** Dan Strickland is visitor services programmer in Algonquin Park District and editor of The Raven, the popular little summer weekly in Algonquin Provincial Park. His "Defence" first appeared in the issue of June 25, 1975.*

live. After all, the risk of being swept downstream should be considerable for a tiny larva only a few millimetres long.

Black fly larvae solve the problem by spinning sticky silken mats of saliva which are attached to submerged objects. Larvae attach themselves to the sticky mats by means of hooks at the rear end of the body. They can move about by alternately gripping the mats with their mouthparts and the rear-end hooks, or by drifting downstream on lifelines of silken saliva.

Normally, a black fly larva stays put, with its rear end holding on, and its body trailing in the current. If the current poses a danger to a tiny insect larva, it also brings substantial rewards to any that can remain stationary. To feed, the black fly larva holds its two fan-like "arms" up into the current and intercepts bacteria, algae, and other food particles being swept along by the stream.

Just how profitable such an arrangement can be may be appreciated by the fact that the number of adult black flies emerging from just one square yard of suitable stream bottom in just one season is typically in the range of 30 thousand . . . Yes, 30,000 black flies from one square yard!

The way they emerge is no less amazing. Black fly larvae transform to adults in open-ended silken cases. When the time comes to emerge, the case fills with gas, and the adult fly rides in a bubble up to the surface. There, the bubble bursts, and the adult is liberated into a new world.

It may come to you as a surprise that adults of all black flies feed on nectar, chiefly that of blueberry flowers. The catch is that the females of some species must have a meal of blood to ensure development of their eggs. As we said earlier, five species regularly bite humans to get the donation.

Especially at their peak in June, biting black flies are no laughing matter, and many a tortured human has asked: "What good are they?"

It's a bit like asking what good is a carburetor. The answer in both cases is "no good at all except as part of a system." Just as a carburetor is a vital ingredient in the system of parts which make up a functioning car, black flies are an integral part of a system — in this case, a living community.

As adults, black flies are a major food item for fly-catchers and swallows, and they may be one of the most important pollinators of blueberries.

As larvae, they remove huge quantities of bacteria and algae from the water. They also constitute food for fish. One of many black fly studies conducted in the Park showed that 16 per cent by volume of the food taken by brook trout in the Oxtongue River consisted of black fly larvae and adults.

So the next time you pick a blueberry or catch a trout, lift your hat to the black fly — but not too long or she'll get you!

The black fly. It was such a little terror that inspired the song: "Gonna die with the black fly pickin' my bones in north Ontar-i-o."

A private pond owner feeds his rainbow trout. Photo by A. A. Wainio.

LOOK TO THE RAINBOW

by A. M. McCombie and A. H. Berst
Research Scientists, Fish and Wildlife Research Branch

IN ONTARIO, the management of ponds for angling began in the 1890s and from the outset the brook trout, *Salvelinus fontinalis,* has always been the favourite species for stocking. The popularity of this native fish is indeed deserved on the grounds of beauty, sportiness and flavour. Unfortunately, it requires very cool, well aerated water to survive, and suitable water supplies are relatively hard to come by. Consequently, more and more attention has been focused on the rainbow trout, *Salmo gairdneri,* because it fares well at higher temperatures. In recent years it has been stocked in farm ponds, private ponds and fishing club ponds. However, to predict the rainbow's potential one must understand how and why its performance may vary from one pond to another.

Of the many factors which determine the success or failure of any species of fish in a pond, the temperature, dissolved oxygen concentration and food supply are most important. Other conditions such as acidity, alkalinity, turbidity and pollution, while they may be important in particular instances, are not of general concern.

TEMPERATURE

Whether a particular species of fish can survive in a pond depends primarily upon its temperature tolerance and upon the extreme temperatures it is likely to encounter in that pond. Rainbow trout can stand temperatures from just above freezing to about 25°C. If the pond temperature rises above this range and if the fish cannot escape into cooler water, they will die.

Within the tolerance range, growth accelerates and the fish swim and feed more actively as the pond warms up, until an optimum temperature is reached. Then at higher temperatures these activities slow down again. For the rainbow trout the optimum temperature is in the neighbourhood of 18°C compared to 13°C for the brook trout. Consequently the rainbow grows best and is most lively in the spring and fall when

Low-lying land becomes a valuable rainbow trout pond. Photo by A. A. Wainio.

water temperatures are optimal.

At other times of year, these fish tend to select that part of the pond which has a temperature closest to the optimum. As any angler knows, trout are found in the deeper, cooler layers during summer, whereas in spring and fall, when water temperatures are more or less the same from surface to bottom, they feed in shallow water or at the surface. It is under these latter circumstances that trout are most likely to take dry flies.

Another way in which temperature can affect fish profoundly is through sudden changes. Normally, ponds warm up gradually during the spring and early summer, giving the fish a chance to become acclimated to progressively higher temperatures. However, it sometimes happens that water temperatures rise so rapidly that the fish do not have time to adjust and some of them, particularly the weaker ones, may die. This may also happen when fish are transferred from hatchery raceways at temperatures of 9 to 13°C to a pond at 21°C or higher. The best

A catch of rainbow trout from a farm pond. Photo by A. H. Berst.

way to avoid the latter problem is to schedule the plantings for the spring or fall, when the pond and hatchery temperatures will be most nearly alike. Summer plantings are hazardous!

OXYGEN

Although rainbow trout have been known to survive in ponds at oxygen concentrations below one part per million during the winter, when their activities are greatly slowed down by the cold, it is generally considered that there should not be less than 5 ppm for satisfactory survival and growth. There are reports that the growth rate of this species will be halved if the oxygen concentration is reduced from 10 to 12 ppm to 3 to 4 ppm. Oxygen concentrations are most apt to become critical in mid-summer and in winter when the pond is frozen over.

At the other extreme, there are a few cases on record where the water has been supersaturated with oxygen (20 to 25 ppm at 13 to 18°C) and fish have died from gas bubble disease. This was caused by excessive photosynthesis by aquatic plants under unusual conditions. Fish can only take oxygen from the water when it is in solution. When supersaturation occurs, the oxygen may come out of solution and form minute bubbles which can collect on the surface of any object in the water. If they collect on the gills of a fish, these bubbles actually interfere with the uptake of dissolved oxygen. Bubbles of oxygen can also cause skin irritations but such cases are rare.

pH

Fish can tolerate water ranging from slightly acid to somewhat alkaline, that is, from pH 5 to 9. This is seldom a problem because almost all natural waters in Ontario fall within this range.

FOOD

Rainbow trout eat a wide variety of organisms and their growth may vary greatly with the quantity and size of food available. As the fish grow, they tend to select larger items for food and there is evidence that larger items are converted into fish flesh more efficiently than smaller ones. Hence ponds with frogs, small fish and crayfish tend to give higher growth rates than small, warm ponds with only snails, minute worms and small insect larvae.

Seasonal changes affect growth rates. During the spring and fall, when the fish are in shallow water, they may feed on minnows, crayfish and the larger insect larvae such as dragonflies. In the summer, when they are compelled to seek deeper, cooler layers, the fish may have to get by on certain small insect larvae or worms which can survive at lower oxygen concentrations.

POND VEGETATION

Sooner or later some form of plant life will establish itself in any pond and in most instances it will play a useful role. The hosts of microscopic plants known as phytoplankton, which float about in the open waters of the pond, serve as food for the insect larvae and other small creatures which are, in turn, the food for the fish. On the other hand, the larger plants which grow up from the bottom of the pond help to stabilize the sediments and reduce turbidity, as well as providing a suitable habitat for insect larvae and other food organisms. Some of these plants, notably the stonewort, *Chara,* have a shading effect and provide a cool refuge for trout during hot weather.

THE POND ENVIRONMENT

Ponds may be grouped into three main categories according to whether their water supplies are standing, intermittent or continuously flowing. The first includes excavated ponds and flooded quarries which intercept the water table. The second comprises ponds built by damming intermittently flowing streams which run only during snow melt or heavy rainfall. The last group includes spring-fed ponds, on-stream ponds and by-pass ponds. Generally speaking, ponds in the last category are the coolest and best aerated.

Where seepage from septic tanks, drainage from barns or run-off from fertilized fields is allowed to enter a pond, algae and other plant life may be stimulated to excessive growth. Besides spoiling the appearance of the pond and snagging the anglers' lines, these excessive growths sometimes lead to severe oxygen depletion when they die and decompose. Hence care should be taken to avoid these situations when selecting a pond site.

Large ponds (twenty acres or more) usually offer more opportunity than small ones for clubs or public fishing, but they require large plantings and are more difficult to manage when it comes to coarse fish removal or aquatic weed control. On the other hand, a relatively small, well designed and managed pond (up to ten acres) can provide satisfying angling for the individual

Resource Technician Harry Tuvi weighs and measures rainbow trout and conducts other tests during a study of trout ecology in a four-acre pond.
Below: a good pond for rainbow trout. Photos by A. H. Berst.

By-pass ponds can be drained to remove undesirable fish species or nuisance plant growths. Above: seining fish in shallow water. Below: a rainbow trout pond in a natural setting enhanced to attract wildlife. Photos by A. A. Wainio.

pond owner and his friends.

A deep pond is usually to be preferred because its deeper strata offer a cool refuge for trout during summer. Ponds where the bottom falls off steeply from the shore are apt to have less trouble with plant growth. However, if a pond is too deep, there may be a sharp temperature stratification in summer and the oxygen in the deeper layers may become severely depleted. Under these conditions, rainbow trout would be sandwiched between the warm upper layers and the oxygen-deficient bottom waters.

STOCKING

The number of fish to be planted depends chiefly upon the size of the pond, how many anglers are expected to fish it, how much time they will spend fishing and how many fish they will be satisfied to catch. The most useful measure of angler satisfaction is the *catch per unit effort,* the number of fish caught on one rod in one hour. While an angler may sometimes catch several fish in one hour under favourable circumstances, the average catch per unit effort will be much less and is the realistic standard to aim for in stocking.

Records for a 30-acre pond, stocked annually with 1,000 to 1,200 eight-inch rainbow trout and subject to about 500 rod hours of angling by club members each year, showed an average catch per rod hour of 1.07 fish. This was considered to be satisfactory fishing. If more anglers were to spend more time fishing this pond, the plantings would have to be increased proportionally to maintain the same level of success.

To obtain a satisfactory catch per unit effort from smaller ponds, on which there might be 100 to 200 rod hours of angling per year, the following stocking rate is recommended: 300 to 500 fingerlings per acre per year or 200 to 300 yearlings. Fingerlings are three to five inches long while yearlings are six to eight inches. The higher ratio of fish-to-area recommended for smaller ponds helps to compensate for the fact that the fish are more confined, and, presumably, more vulnerable in these waters.

As a rule, the larger the fish planted, the better their chance of survival and the sooner angling may commence. On the other hand, the larger the fish, the more expensive they are likely to be, since they require additional feeding and care in the hatchery. Fingerlings can be used, where cost or availability is an important consideration, but larger numbers are required and it takes an extra year for them to reach catchable size. Moreover, since fingerlings are particularly vulnerable to predation or competition from other species, it is advisable to eliminate any suckers, chub, sunfish or bass before the planting is made.

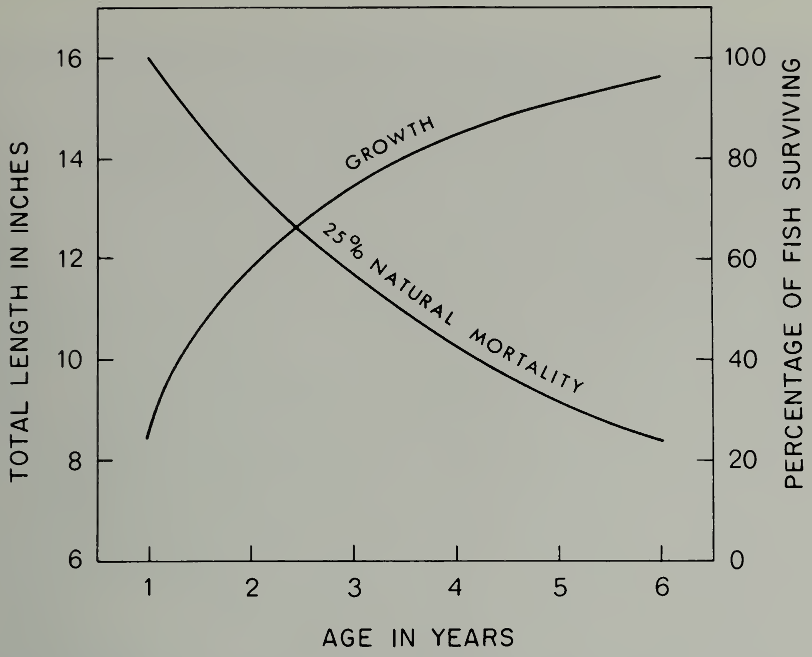
Common sense and experience tell us that the catch for the effort expended will decline as the fish are removed by anglers, or die naturally, unless there is adequate replacement by natural reproduction or stocking. Since few, if any, ponds in Ontario meet all the requirements for natural reproduction of rainbow trout, it is usually necessary to plant hatchery-reared fish to maintain the fishing quality. In the 30-acre pond mentioned above, good results have been obtained by planting once a year in April. Where very heavy fishing is anticipated, as in public fishing areas, supplemental plantings can be made from mid-September onwards to support fall or winter angling. For ponds which are only fished once in a while, it may be sufficient to stock every second or third year. It should be realized that it is not at all unusual for 30 to 60 per cent of the fish to die of natural causes each year.

Rainbow trout are available from about 40 privately operated commercial hatcheries throughout southern Ontario. A list of these hatcheries may be obtained from any District Office of the Ontario Ministry of Natural Resources.

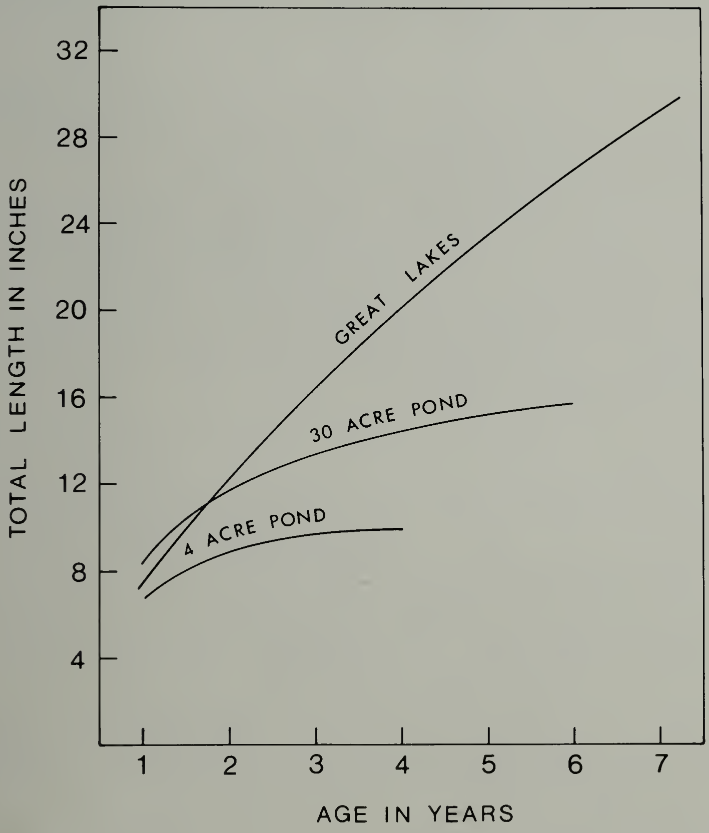
GROWTH

Every angler dreams of catching the biggest fish ever, but the size of the catch will depend on how fast it grows and how long it lives in the body of water fished. In general, rainbow trout grow much faster and live longer in large lakes than in ponds because they have a greater choice of optimum food, temperature and oxygen conditions. In the Great Lakes and their tributaries, rainbow trout have been known to live from six to eight years and attain lengths of 26 to 36 inches. Any angler, whose sole interest is in catching trophy fish, might be wise to confine his efforts to these waters.

Growth of rainbows in ponds is likely to be more modest and variable. For example, in the 30-acre pond cited above, the rainbows lived up to six years of age and reached a length of 18 inches and a weight of two pounds. In small ponds of two to three acres, they may not survive much beyond three or four years and may only reach 12 to 14 inches in length and half a pound in



Growth and mortality curves of rainbow trout in a pond indicate larger but fewer fish as time goes on. Notice the size limit in this sampling.



Representative growth curves of rainbow trout showing the effect of pond size.

weight. Nonetheless, even these fish can provide lots of sport on light tackle and be very tasty indeed when served with a slice of lemon or strip of bacon!

From time to time, pond owners ask whether they could improve the growth and survival of their trout by feeding them one of the prepared foods available on the market. The answer is yes, you probably could. Besides supplementing the diet, artificial feeding would cut down on the amount of food which the fish have to burn up, so to speak, to produce the energy required to search out and capture natural food. However, fish, like dogs and other domestic animals, quickly learn where their next meal is coming from and could become unduly vulnerable to the angler or poacher. There is also some argument as to whether artificial foods have an undesirable effect on the flavour of the fish. Any excess food, which the fish do not consume, will be decomposed by the bacteria in the water and this process may use up considerable oxygen.

HEADACHES AND HELPFUL HINTS

There may, of course, be some headaches involved in managing a pond. Far too often, ponds built by damming or by-passing streams are provided with surface outflow only and with inadequate means of drainage. One way to prevent or correct oxygen depletion in the deeper strata of a pond is to install a spillway which allows water to be drawn off near the bottom and replaced with aerated water from above.

On continuously flowing streams, this bottom draw-off will handle both summer and winter oxygen deficits. On intermittent streams, it is effective only during the spring run-off. Where a suitable spillway cannot be installed, bottom draw-off can sometimes be accomplished with pumps or siphons but these methods are more expensive and troublesome and are poor substitutes for a well-designed spillway.

It is virtually impossible to safely and effectively remove undesirable fish or nuisance plant growths from in-stream impoundments by chemical means. On the other hand, by-pass ponds can be drained and the outflow stopped for a week or more to permit the chemical to take effect and then detoxify. The lower the pond can be drawn down, the less chemical will be required. At low water levels fish will be crowded and vulnerable to chemicals. When the pond can be fully drained the most effective materials for controlling plant growth, soil sterilants, can be applied to the dry soil.

When the dissolved oxygen in the bottom waters of a pond has been used up, the decomposition of dead plant and animal matter is taken over by species of bacteria which can function in the absence of oxygen. When this happens the end products of decomposition include such foul smelling substances as ammonia, methane and hydrogen sulphide. If the fish do not die from lack of oxygen, these substances will poison them. In dug ponds and other situations where it may be impossible to prevent oxygen depletion by bottom draw-off, the problem can sometimes be solved by pumping air into the deepest part of the pond through a perforated hose or other distributing device. Pumping equipment which aerates only the top three to four feet of water is of little or no use.

Hydrogen sulphide and supersaturation with nitrogen, either individually or in combination, may cause trouble where the water supply comes from deep wells or from springs originating in highly organic soils. Supersaturation with nitrogen causes gas bubble disease. This problem can usually be solved by spraying the water into the air from some sort of fountain or allowing it to cascade down a series of baffles in a tower.

REGULATIONS

Finally, since a pond owner usually shares the water resource with neighbours on the same watershed or the same water table, there are certain government regulations with which he or she must comply. The construction of a dam or excavation of a pond, the planting of fish, angling on a fee basis, or the sale of fish from ponds for food all require appropriate permits from the Ontario Ministry of Natural Resources. All angling in ponds must comply with the Ontario Fisheries Regulations with respect to seasons and daily limits. Winter fishing may be authorized by special permit.

The amount of water which may be drawn from a well, stream or lake to supply a pond is regulated by the Ontario Ministry of the Environment. The latter ministry, in cooperation with the Ministry of Natural Resources, is also responsible for issuing permits for the application of chemicals to remove undesirable fish or control algae and other nuisance plant growths. More detailed information and application forms may be obtained from local offices of the respective ministries.

Darlington sportsmen were friendly competitors but keen critics. Photo by A. W. Smith.

DARLINGTON DAY

Attendance topped 5,000 at the Sportsman's Waterfowl Day in Darlington Provincial Park, September 7, 1975. People from many walks of life concentrated around the six events which decided the Ontario waterfowling championship. Earl Newhall of Orillia led the field, closely followed by Al Taylor, also of Orillia, who won the national duck calling championship. Women's events included trap shooting and a duck plucking contest, and special events were staged for children. The fourth annual Darlington Day, co-sponsored by the Ontario Federation of Anglers and Hunters and the Ministry of Natural Resources, was a pleasure if you liked turtle soup, wildlife art or lively competitions. Thirty-five turkeys were won in the turkey shoot, and things were hopping at the frog jumping contest.

— A. W. Smith, extension biologist, Central Region

GIANT CARP FOR ZOO

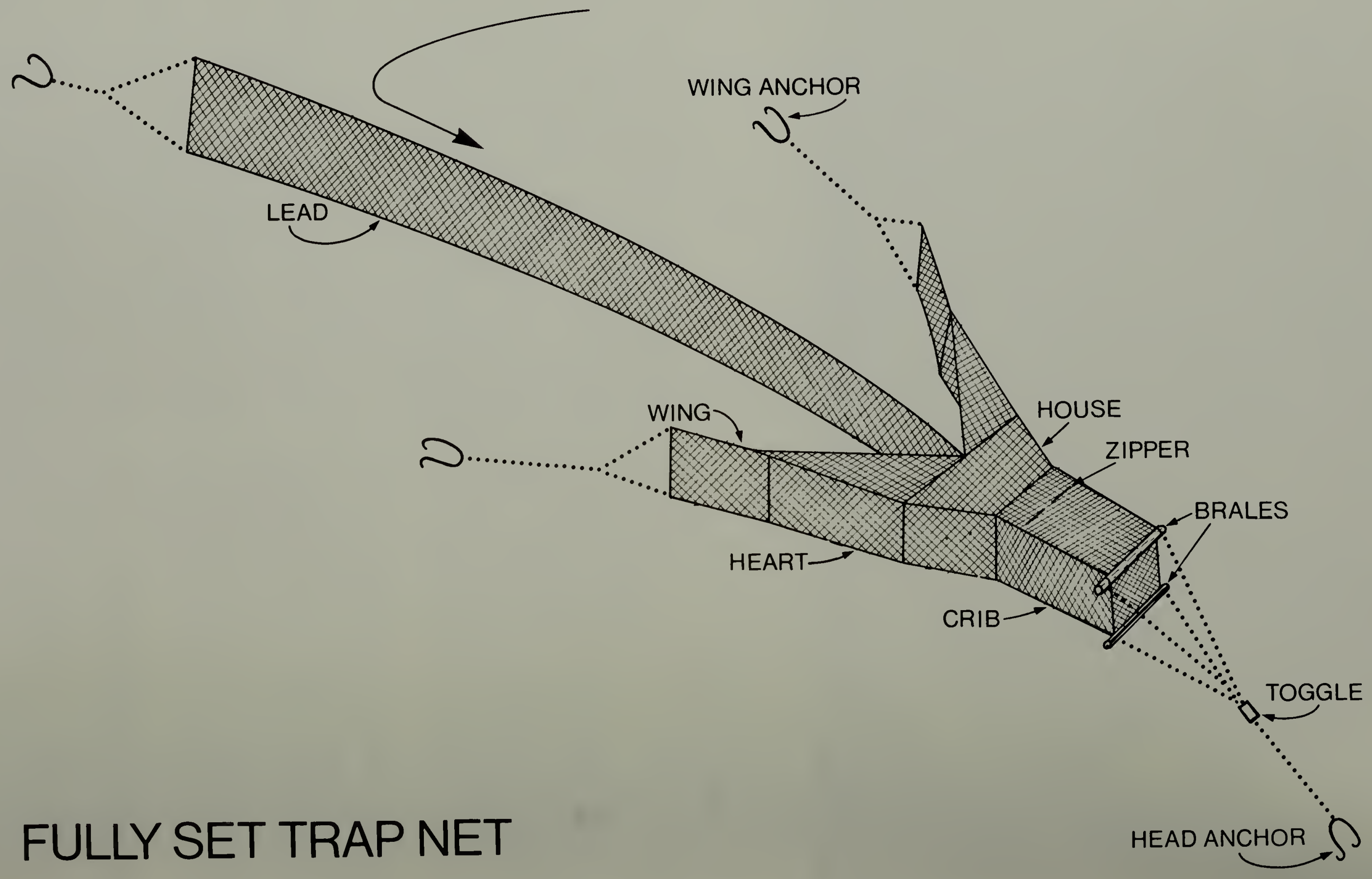
During "Operation Doorstep Angling" a 25-pound carp was taken at the mouth of Duffin Creek. It was the largest carp captured in a two-year assessment of the fisheries in the Toronto area. It was kept alive and given to the Metro Zoo where it is displayed as a fine specimen of a species unjustly thought to be unworthy of an angler's time. The zoo's live fishes include bowfin, brown bullhead, largemouth bass, white bass, northern pike, white perch and yellow perch, all taken from the waters about Toronto.

— Ian Macnab, biologist, Maple District

ROAD-KILLED MOOSE

Many people are wondering what becomes of road-killed moose. The owner or operator of the vehicle hitting the moose has no claim to the animal. It belongs to the Crown, and it is the responsibility of the Ministry of Natural Resources to dispose of it. If the animal is fit for human consumption, it is given to needy persons. If it is no longer fit for human consumption, it is placed in the bush where other animals can feed from it and clean up the remains.

— T. T. Leach, C.O., Geraldton District



FULLY SET TRAP NET

Carl Monk prepares to measure (not bite) a northern pike taken from Lac des Mille Lacs. Note spread of trap net hearts in water. — Photos by V. O. Sheeler.

TRAP NETS — TOOLS OF FISHERIES MANAGEMENT

by R. J. Gater, Assistant Net Builder
Net Section, Central Region

THE purpose of fisheries management is to regulate fish populations within the biotic limits of the habitat. Trap nets, trawl nets, gill nets, and their variations are tools which are used at some stage in any fisheries management program.

Gill nets are used to determine the species composition of fish populations and for various other studies where it is not necessary to retain live fish. Of course, gill nets are used extensively by commercial fishermen because of their relatively low cost and ease of handling, and because these nets can be species-specific, depending on the size of mesh. For example, 2⅝-inch mesh is used to catch perch, 3½-, to 4½-inch mesh is used for whitefish, and 10-, to 12-inch mesh is used to take carp and sturgeon.

Trawl nets have enjoyed commercial success on Lake Erie because of the large concentrations of smelt and because of the lake's flat bottom which makes trawling feasible. However, on Lake Ontario, trawls have been used only experimentally.

The trap net is used in most management programs when it is desirable to return fish to the lake alive. The trap net is suitable for studying populations, migratory patterns, growth rates and stocking success, and for gathering spawn for hatchery incubation. Repeated samplings with trap nets can reveal the changing status of fish populations.

A trap net is a stationary live-capture device, constructed of twine webbing sewn to polypropelene lines. When fully assembled, it will take the shape of a box with a funnel-like projection in front of it (see diagram).

The parts of the trap net are lead, wings, hearts, house, tunnel and crib. The net is suspended by floats attached to the top lines and anchored by weights attached to the bottom lines. At the end of the crib are two poles called "brales". The top pole is cedar for buoyancy, and the bottom pole is steel pipe to keep the net stretched.

The trap net works on the principal that when fish encounter the lead they will move into deeper water and try to swim around

Taking maskinonge from trap net on Stoney Lake.

the obstruction. Usually, the lead is attached to the shoreline at right angles and extends into the lake to the mouth of the house. The fish will work along the lead and finally into the house.

When fish enter the house, they have two alternatives. They can go straight ahead, enter the tunnel, and be trapped in the crib. Or they can go to the walls of the house and try to work their way out, but eventually they will arrive in the heart. The heart is designed to turn the fish around and head them toward the tunnel which leads to the crib where they are trapped.

The main disadvantage of a trap net is that it can only be used in limited depths of water. As the depth of water increases, the catch efficiency of the trap decreases because fish may swim over the submerged lead. The "rule of thumb" is that a net should be at least four feet under the surface of the water, and no deeper than double the height of the net. Thus, an eight-foot net fishes best in water from 12 to 16 feet deep.

An important advantage of the trap net is that captured fish incur no physical damage and can be returned to the lake in good condition. The efficiency of the trap net in catching and holding live fish makes practicable the many important studies which are the foundation of fisheries management programs.

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BULLHEAD — *Continued from Page* 2

move cover for last few minutes of cooking for crisp coating.

Jacks' Campfire Catfish

Clean fish, dry, and salt and pepper generously. For each person to be served, slice one good-size potato and one onion and put into cavity, along with a few dabs of butter. Dip several pages of a newspaper into water and roll in fish, folding ends as you roll so that fish is completely enclosed in damp paper. Place in good bed of coals from campfire and put a shovelful of hot coals over top. Bake for one to 1½ hours depending on how long you can wait.

Modifications being made at Duschesney Creek walleye spawning site.

THE SAGE WAY TO PRODUCE WALLEYE

Report and photos by M. L. Hart
Fisheries Management Officer, North Bay District

THE city limits of North Bay surround a considerable parcel of elevated land which is not grand enough to be called a mountain but it is a very important hill. Many yards below its tree-covered surface is located the military establishment named Semi - Automatic Ground Environment (SAGE) which is a vital part of the North American Air Defence Command popularly known as NORAD.

To provide a home for SAGE which would be able to survive a bout of atomic warfare, a huge cavern was excavated beneath the hill and it presently shelters a small below-surface community complete with bus transportation and police force. To say more about SAGE might help the bad guys so the writer leaves the reader to his or her imagination.

You are probably wondering what SAGE and NORAD have to do with walleye. Well, the Lake Nipissing Fisheries Assessment Unit hopes that SAGE is contributing to walleye populations in an indirect way by making available some of the broken rock excavated from the underground cavern. The rock is being used to improve and rehabilitate Lake Nipissing walleye spawning areas which have deteriorated over the years. One might think that quantities of suitable broken rock would be easy to obtain in the North Bay area but this is not the case. It is the availability of SAGE rock which enables us to carry out some of our management projects.

In the spring of 1973, walleye were observed ascending Duchesney Creek for the first time in several years. The creek was blocked by an old dam which prevented the walleye from reaching 11½ acres of suitable spawning grounds above the dam. In the fall of the year, 700 cubic yards of broken rock were hauled from SAGE and dumped at the dam site. The dam was then re-shaped into a 50-foot stretch of rapids.

In the spring of 1974, an increased number of walleye returned to the creek to spawn but they still could not negotiate the

Rebuilt rapids at site of old dam on Duschesney Creek.

incline, and further modifications had to be carried out.

In the fall of 1974, 1,400 cubic yards of broken rock were dumped at the creek and distributed to form an enlarged spawning site below the rapids. Additional rock was dumped at the rapids to make the incline more gradual. The Canadian Johns-Manville Company Limited assisted in these modifications.

In February of 1975, two walleye spawning sites were constructed along the northeast shore of Lake Nipissing. A total of 350 cubic yards of broken rock from SAGE and 100 cubic yards of pit-run gravel from a local pit were hauled across the ice to the selected sites.

Both spawning sites, or "points", are triangular in shape. The base of the broken rock site measures 50 feet, and the point extends 70 feet from shore. During the walleye spawning and egg incubation period, the apex of the point is under four feet of water.

The pit-run gravel point has a 20-foot base, a 30-foot extension from shore and a piled depth of three feet. It had been intended to build a larger gravel point, but the quality of the gravel deteriorated and the hauling was terminated.

During the spring of 1975, walleye were observed to be more numerous over the new points than over the adjacent shoreline areas.

If the walleye spawning site improvement and rehabilitation work is successful, it will indeed be a monument to NORAD's SAGE and a benefit to the Lake Nipissing fishery. We are fortunate to have excellent angling in Lake Nipissing but we may not be so fortunate as a strategic target in the event of a clash of super powers. A major clash might set back our fisheries management program.

If you would like to visit an A-bomb target during the friendly days of detente, why not come to North Bay and enjoy some good fishing?

Completed Duschesney Creek project with water level control device.

Broken-rock walleye spawning site.